# CLAIMS

I claim:

1. A system for use with a power supply, comprising:

two double-layer capacitors, the two double-layer capacitors operatively coupled to output terminals of the power supply, wherein each double-layer capacitor comprises a capacitance of greater than or equal to 1 Farad;

a voltage balancing circuit; the voltage balancing circuit operatively coupled to the two double-layer capacitors to balance a power supply voltage applied to the two capacitors; and

a current control device, the current control device including a feedback portion, the current control device coupled to output terminals of the power supply, wherein the current control device controls current flowing through the two double-layer capacitors according to a signal provided by the feedback portion.

2. The system of claim 1, wherein the feedback portion is operatively coupled to the voltage balancing device so as to provide a positive feedback signal to the voltage balancing device.

3. The system of claim 1, wherein the feedback portion is operatively coupled to the voltage balancing device so as to provide a negative feedback signal to the voltage balancing device.

4. A circuit for coupling an energy storage device to an output of a first power supply, the circuit comprising:

a current-sensing resistor;

a switch comprising a pair of outputs coupled in series with the energy storage device and with the current-sensing resistor, and an input receiving a switching signal, the switch assuming a conducting state when the switching signal is at a first level, the switch assuming a non-conducting state when the switching signal is at a second level;

a differential high-gain device comprising an output coupled to the input of the switch, a first input biased by a control voltage, and a second input receiving feedback voltage generated by a charging current flowing through the current-sensing resistor;

wherein:

the output of the differential high-gain device drives the input of the switch with the switching signal at the first level when the control voltage exceeds the feedback voltage by an input offset voltage of the differential high-gain device, and the differential high-gain device drives the input of the switch with the switching signal at the second level when the feedback voltage exceeds the control voltage by the input offset voltage; and

the current-sensing resistor, the switch, and the energy storage device are coupled across the output of the first power supply.

5. A circuit according to claim 4, further comprising a mechanism generating the control voltage as a function of a voltage appearing at the output of the first power supply, wherein the control voltage increases monotonically with the voltage appearing at the output of the first power supply.

6. A circuit according to claim 4, wherein the differential high-gain device comprises an operational amplifier.

7. A circuit according to claim 4, wherein the differential high-gain device comprises CMOS circuitry.

8. A circuit according to claim 4, wherein the differential high-gain device comprises a low-offset device.

9. A circuit according to claim 4, wherein the differential high-gain device comprises a comparator.

10. A circuit according to claim 4, wherein the switch comprises a discrete transistor.

11. A circuit according to claim 4, wherein the switch comprises a discrete power transistor.

12. A circuit according to claim 4, wherein the switch comprises a MOSFET.

13. A circuit according to claim 4, wherein the switch comprises an analog semiconductor switch.

14. A circuit according to claim 4, further comprising a current-limiting resistor coupled between the output of the differential high-gain device and the input of the switch.

15. A circuit according to claim 4, further comprising a first resistor and a second resistor coupled in series to form a voltage divider, the voltage divider being coupled across the output of the first power supply, the voltage divider generating the control voltage at a junction of the first and second resistors.

16. A circuit according to claim 15, wherein the differential high-gain device comprises a low-offset device.

17. A circuit according to claim 16, wherein the first and second resistors are precision, temperature-stable resistors.

18. A circuit according to claim 17, wherein the differential high-gain device comprises CMOS circuitry.

19. A circuit according to claim 4 further comprising the energy storage device.

20. A circuit according to claim 19, wherein the energy storage device comprises a capacitor.

21. A circuit according to claim 19, wherein the energy storage device comprises a double layer capacitor.

22. A circuit according to claim 19, wherein the energy storage device comprises at least two capacitors and a voltage balancer.

23. A circuit according to claim 19, wherein the energy storage device comprises a secondary battery cell.

24. A circuit according to any one of claims 4, further comprising a second power supply, the second power supply comprising input connections coupled across the output of the first power supply to receive power from the first power supply at a first nominal voltage, and an output providing electrical power at a second nominal voltage to a load.

25. A circuit according to claim 24, wherein the second power supply comprises a regulator.

26. A circuit according to claim 24, wherein the second power supply comprises a DC-to-DC power converter.

27. A circuit according to claim 24, wherein the second nominal voltage exceeds the first nominal voltage by about 7 volts.

28. A circuit according to claim 24, wherein the first nominal voltage is about 5 volts, and the second nominal voltage is about 12 volts.

29. A circuit for coupling an energy storage device to an output of a first power supply, the circuit comprising:

a switch comprising a pair of outputs coupled in series with the energy storage device to form a series combination, the series combination being coupled across the output of the first power supply, and an input receiving a switching signal, the switch assuming a

conducting state when the switching signal is at a first level, the switch assuming a non-conducting state when the switching signal is at a second level;

a connection receiving a voltage reference signal; and

a differential high-gain device comprising an output coupled to the input of the switch, a first input biased by a control voltage, and a second input receiving the voltage reference signal;

wherein:

the control voltage is monotonically related to a voltage appearing at the output of the first power supply so that the differential high-gain device drives the input of the switch with the switching signal at the first level when the control voltage exceeds the voltage reference signal by an input offset voltage of the differential high-gain device, and the differential high-gain device drives the input of the switch with the switching signal at the second level when the voltage reference signal exceeds the control voltage signal by the input offset voltage.

30. A circuit according to claim 29, further comprising a voltage reference source generating the voltage reference signal.

31. A circuit according to claim 30, further comprising a first resistor and a second resistor coupled in series with the first resistor to form a voltage divider, the voltage divider being coupled across the output of the first power supply, the voltage divider generating the control voltage at a junction of the first and second resistors.

32. A circuit according to claim 31, wherein the differential high-gain device comprises a low-offset device.

33. A circuit according to claim 31, wherein the first and second resistors are precision, temperature-stable resistors.

34. A circuit according to claim 33, wherein the differential high-gain device comprises CMOS circuitry.

35. A circuit according to claim 31, further comprising the energy storage device.

36. A circuit according to claim 35, wherein the energy storage device comprises a capacitor.

37. A circuit according to claim 35, wherein the energy storage device comprises a double layer capacitor.

38. A circuit according to claim 35, wherein the energy storage device comprises at least two capacitors and a voltage balancer.

39. A circuit according to claim 35, wherein the energy storage device comprises a rechargeable battery cell.

40. A circuit according to claim 31, wherein the differential high-gain device comprises an operational amplifier.

41. A circuit according to claim 31, wherein the differential high-gain device comprises CMOS circuitry.

42. A circuit according to claim 31, wherein the differential high-gain device comprises a comparator.

43. A circuit according to claim 31, wherein the switch comprises a discrete transistor.

44. A circuit according to claim 31, wherein the switch comprises a discrete power transistor.

45. A circuit according to claim 31, wherein the switch comprises a MOSFET.

46. A circuit according to claim 31, wherein the switch comprises an analog semiconductor switch.

47. A circuit for coupling an energy storage device to an output of a first power supply, the circuit comprising:

a switch comprising a pair of outputs coupled in series with the energy storage device to form a first series combination, the first series combination being coupled across the output of the first power supply, and an input receiving a switching signal, the switch assuming a conducting state when the switching signal is at a first level, the switch assuming a non-conducting state when the switching signal is at a second level;

a connection receiving a voltage reference signal;

a first resistor and a second resistor coupled in series to form a second series combination comprising a junction of the first and second resistors, the second series combination being coupled across the output of the first power supply;

a differential high-gain device comprising an output coupled to the input of the switch, a non-inverting input coupled to the junction of the first and second resistors, and an inverting input receiving the voltage reference signal; and

a positive feedback resistor coupled between the output of the differential high-gain device and the non-inverting input of the differential high-gain device.

48. A circuit according to claim 47, further comprising a voltage reference source generating the voltage reference signal.

49. A circuit according to claim 48, wherein the differential high-gain device comprises a low-offset device.

50. A circuit according to claim 49, wherein the first, second, and positive feedback resistors are precision, temperature-stable resistors.

51. A circuit according to claim 50, wherein the differential high-gain device comprises CMOS circuitry.

52. A circuit according to claim 48, further comprising the energy storage device.

53. A circuit according to claim 49, wherein the energy storage device comprises a capacitor.

54. A circuit according to claim 50, wherein the energy storage device comprises a double layer capacitor.

55. A circuit according to claim 50, wherein the energy storage device comprises at least two capacitors and a voltage balancer.

56. A circuit according to claim 48, wherein the differential high-gain device comprises an operational amplifier.

57. A circuit according to claim 48, wherein the differential high-gain device comprises CMOS circuitry.

58. A circuit according to claim 48, wherein the differential high-gain device comprises a comparator.

59. A circuit according to claim 48, wherein the switch comprises a discrete transistor.

60. A circuit according to claim 48, wherein the switch comprises a discrete power transistor.

61. A circuit according to claim 48, wherein the switch comprises a MOSFET.

62. A circuit according to claim 48, wherein the switch comprises an analog semiconductor switch.

63. A method for coupling an energy storage device to an output of a power supply, the method comprising:

coupling the energy storage device in series with a switch controllable by a switching signal;

generating a feedback signal representing current flowing into the energy storage device;

comparing the feedback signal to a predetermined control signal; and

generating the switching signal to turn off the switch when the comparing step indicates that the current is not lower than a predetermined level.

64. A method for coupling an energy storage device to an output of a power supply, the method comprising:

coupling the energy storage device in series with a switch controllable by a switching signal;

generating a reference signal;

generating a signal representing voltage at the output of the power supply;

comparing the reference signal to the signal representing voltage at the output of the power supply; and

generating the switching signal to turn off the switch when the comparing step indicates that the voltage at the output of the power supply is below a predetermined level.

65. A system for use with a power supply, comprising:

a load, the load coupled to output terminals of the power supply;

a charge storage device device; and

a current control device, the charge storage device and the current control device coupled to output terminals of the power supply, wherein the current control device controls current flowing through the charge storage device.

66. The system of claim 65, wherein the charge storage device comprises a capacitor.

67. The system of claim 66, wherein the capacitor comprises a nominal operating voltage of no more than about 3 volts.

68. The system of claim 66, wherein the capacitor comprises a double layer capacitor.

69. The system of claim 66, wherein the capacitor comprises a value between 1 Farad and 5000 Farad.

70. The system of claim 65, wherein the charge storage device comprises 2 series connected capacitors, and wherein to the two series connected capacitors are coupled to a voltage balancing circuit.

71. A circuit for use with a power supply, comprising:

a charge storage device device; and

a current control device, the charge storage device and the current control device coupled to provide output terminals, wherein the current control device controls current flowing through the charge storage device when the output terminals are coupled to the power supply.

72. A circuit for use with a power supply, comprising:

charge storage means for storing charge; and

current control means for controlling current through the charge storage means when the charge storage means and current control means are coupled to the power supply.